CLAIMS

What is claimed is:

1. An energy absorbing device for a vehicle, comprising:

a polymeric material;

a blowing agent mixable with the polymeric material to operably form a foam; and

a foam body formable from the foam, the foam body having a substantially uniform first face and an opposed second face;

wherein the foam body defines an energy absorbing device of a vehicle.

2. The device of Claim 1, wherein the polymeric material comprises a polyethylene material.

3. The device of Claim 1, wherein the blowing agent comprises one of an azodicarbonamide, a phenyltetrazole and a bicarbonate/acid.

4. The device of Claim 1, wherein the polymeric material comprises at least one of polyurethane, polyethylene, polypropylene, polyester, polycarbonate/ polyester alloy, ethylene vinyl acetate copolymer, amide, ionomer, polycarbonate, acrylonitrile butadiene styrene, polybutylene therephthalate, thermal plastic olefin, thermoplastic elastomer, polyethylene terephtalate,

polyethylene terephtalate copolymer with glycol, acetyl, and/or polyphenyline oxide.

5. The device of Claim 4, wherein the blowing agent comprises one of an azodicarbonamide, a phenyltetrazole and a bicarbonate/acid.

6. The device of Claim 1, comprising a plurality of ribs formable on the second face of the foam body.

7. The device of Claim 6, wherein adjacent ribs define a partial cavity in the foam body.

8. The device of Claim 1, comprising at least one bumper connecting element formable on the foam body defining at least one vehicle-to-bumper interface point.

9. The device of Claim 1, wherein the energy absorbing device further defines a vehicle bumper insert.

10. The device of Claim 1, wherein the energy absorbing device further defines a vehicle body insert.

11. The device of Claim 10, wherein the vehicle body insert comprises one of a vehicle door member, a vehicle hood member, a vehicle trunk cover member and a vehicle body panel member.

12. A method for forming energy absorbing components for vehicles, the method comprising:

mixing a combination having a polymeric material resin and a blowing agent;

heating the combination to form a liquefied combination;

pressurizing the liquefied combination to prevent substantial expansion of the liquefied combination prior to injection;

cooling a mold operable to receive the liquefied combination; and

injecting the liquefied combination into the mold to operably form an energy absorbing component of a vehicle.

13. The method of Claim 12, comprising varying a rate of injection flow of the liquefied combination into the mold during the injecting step.

14. The method of Claim 12, comprising maintaining a surface temperature of the mold at or below an ambient temperature prior to the injecting step.

15. The method of Claim 12, comprising:

maintaining a continuous coolant flow to the mold;

retaining the energy absorbing component in the mold for approximately one minute after the injecting step; and

removing the energy absorbing component from the mold.

16. The method of Claim 12, comprising:

connecting a source of chilled water to the mold; and

directing a chilled water volume to the mold to assist cooling the mold.

17. The method of Claim 12, comprising inserting at least one coolant pin through the mold to operably contact the component.

18. The method of Claim 17, comprising:

connecting a source of coolant gas to the coolant pin; and

flowing a coolant gas into the component through the coolant pin.

19. The method of Claim 18, comprising pre-chilling the coolant gas prior to the flowing step.

20. A process to produce an energy absorbing material, comprising:

predetermining a wall thickness for an energy absorbing component;

forming a mold for the energy absorbing component;

mixing a combination having a polymeric material resin and a blowing agent;

heating the combination to form a liquefied combination;

transferring the liquefied combination into a mold; and

controlling a temperature, a pressure and an injection rate of the liquefied combination to operably form a foam part having the predetermined wall thickness.

21. The process of Claim 20, comprising selecting the wall thickness within a range of wall thicknesses varying between approximately 4.0 mm and approximately 50 mm.

22. The process of Claim 20, comprising selecting the wall thickness of approximately 6 mm.

23. The process of Claim 20, comprising cooling the mold using one of an ambient temperature and a below ambient temperature coolant.

24. The process of Claim 23, comprising positioning at least one coolant injection pin in the mold.

25. The process of Claim 24, comprising flowing an inert gas into the coolant injection pin.

26. The process of Claim 23, comprising controlling a mold cycle time to less than ten minutes.

27. The process of Claim 23, comprising cooling both the mold and the foam part to operably provide a mold cycle time of approximately one minute.

28. An impact absorbing member produced by the process of Claim 20, comprising:

a foam body formable from the foam, the foam body having a first face and an opposed second face;

a plurality of ribs formable in the second face of the foam body defining a plurality of partial cavities; and

a geometry of the foam body selectable to conform the first face to a motor vehicle component.

29. The member of Claim 28, wherein the motor vehicle component comprises a bumper assembly.

30. The member of Claim 29, wherein the foam body comprises at least one mechanical attachment member for operably joining the foam part to the bumper assembly.

31. The member of Claim 28, wherein the ribs comprise a wall thickness ranging between approximately 4 mm to approximately 50 mm.

32. The member of Claim 28, wherein the ribs comprise a wall thickness of approximately 6 mm.

33. A method for constructing energy absorbent bumpers for a motor vehicle, comprising the steps of:

constructing a mold;

combining a polymeric resin and a foaming agent into a foam mixture;

injection molding the foam mixture in the mold to operably form an energy absorbing foam component;

inserting the energy absorbing foam component into a bumper assembly; and

attaching the bumper assembly onto a bumper beam of a vehicle.

34. The method of Claim 33, comprising forming a plurality of ribs in the foam component.

35. The method of Claim 34, comprising varying a quantity of the ribs to operably alter a load absorption capability of the foam component.

36. The method of Claim 33, comprising varying a wall thickness of the foam component to operably alter a load absorption capability of the foam component.

37. The method of Claim 33, comprising inserting the foam component into a preformed bumper fascia.